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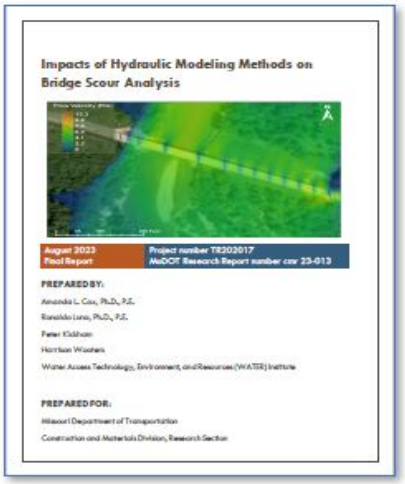
Research Summary

Impacts of Hydraulic Modeling Methods on Bridge Scour Analysis



The goal of this study was to examine the impact of hydraulic modeling on bridge scour in Missouri. The study primarily focused on contrasting 1D vs. 2D hydraulic modeling techniques. The research team also developed recommendations for sediment/soil sampling methods and conducted bridge scour risk assessments for the five bridges studied.

Field data were collected at five study sites to obtain the required terrain and soil/sediment input data for hydraulic modeling and scour analyses. The recommended methods developed for soil/sediment sampling in the overbank areas are soil augers or test pits, and for overwater locations, a FISP or clamshell samplers.

"For all bridge sites evaluated, estimates for at least one of the main scour categories were more than 50% different between the HEC-RAS 1-D and SRH-2D results."

Contraction, abutment, and pier scour depths were computed using the HEC-18 guidelines with hydraulic conditions determined from a 1-D model (HEC-RAS) and a 2-D model (SRH-2D). Determining the required input parameters for scour calculations from HEC-RAS results was found to be difficult with many potential sources of human error. In contrast, the Hydraulic Toolbox program for scour calculations can auto-populate the required input parameters directly from SRH-2D output data. For all bridge sites evaluated, estimates for at least one of the main scour categories (i.e., channel contraction scour, pier scour, or abutment scour) were more than 50% different between the HEC-RAS 1-D and SRH-2D results.

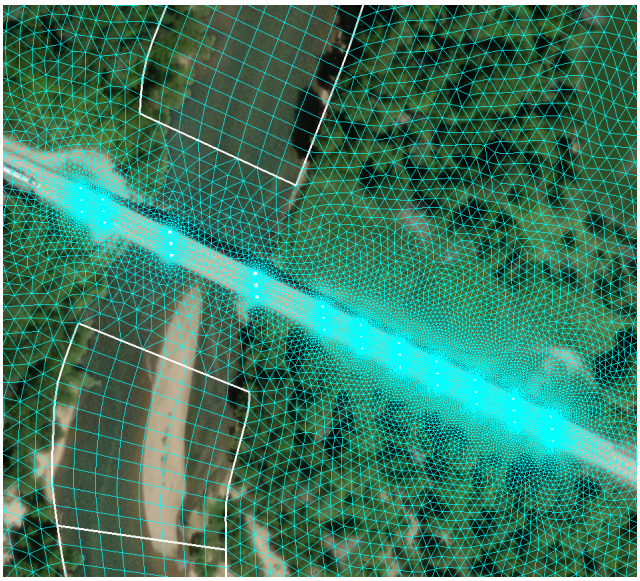


Figure 1: 2D Modeling Mesh around Bridge

The key findings from comparing model results were: 1) the angle of attack was the dominant pier scour input parameter and 2) flow conveyance over inundated roadway embankments was significantly greater for SRH-2D relative to the HEC-RAS model.

The 2-D modeling methods are recommended for future use given the significant differences observed between the 1-D and 2-D scour results, increased availability of terrain data, current computing resources, and ease of use. Finally, due to differences in the HEC-RAS and SRH-2D estimated scour depths, reanalyzing high-risk and/or visually vulnerable bridges is recommended.

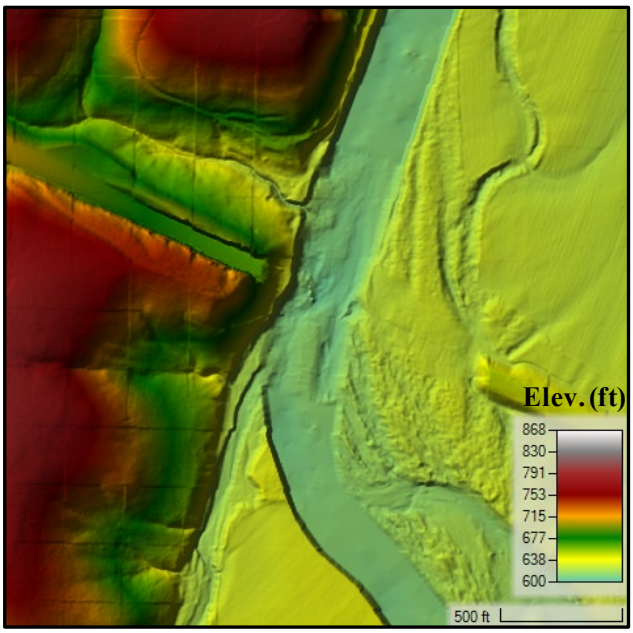


Figure 2: Composite Terrain Model

Project Information

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